Understanding Nurses' Information Needs and Searching Behavior in Acute Care Settings

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ABSTRACT

We report the results of a pilot study designed to describe nurses' information needs and searching behavior in acute care settings. Several studies have indicated that nurses have unmet information needs while delivering care to patients. AIM: Identify the information needs of nurses in acute care settings. METHODS: Nurses at three hospitals were asked to use an information retrieval tool (CPG Viewer). A detailed log of their interactions with the tool was generated. RESULTS AND CONCLUSIONS: Our findings suggest that nurses' information needs are different from what is reported in the literature in terms of physicians' information needs. Questions regarding a nursing procedure or protocol were the most common needs nurses had.

INTRODUCTION

In 1968, Taylor explained the need for information in four steps: "*visceral need*", "*conscious need*", "*formalized need*", and "*compromised need*". The *visceral need* is an unexpressed need, but it becomes a *conscious need* when a person creates a mental description of it. A person then formalizes the need into a rational statement and may seek an answer to it by using an information system, transforming it into a *compromised need* [1]. Usually, we refer to the latter three needs when we say "*information needs*". Nicholas points out that *information needs* arise when a person recognizes a gap in his/her state of knowledge and wishes to resolve that anomaly [2]. Within the context of this article, we are restricting *information needs* to *compromised needs*, since we are analyzing nurses' use of an information system to resolve their knowledge gaps.

To date, many studies address physicians' search behaviors and information needs [4,5,6,7], but few authors report studies describing nurses' search behaviors and information needs [8,9]. Our goal is to examine nurses' information needs and searching behavior in acute care settings. We chose acute care settings because they cover a broader range of patient diagnoses, potentially leading to the generation of more information needs.

In 1996, Intermountain Health Care (IHC) created the "*Clinical Consistency Project*" (CCP) to develop and implement consensus-based interdisciplinary standards, aiming at reducing variability of care [10]. These standards, now called "*Collaborative Practice Guidelines*" (CPGs), correspond to a collection of over 2,400 documents that cover IHC's 100 top Diagnosis-Related Groups (DRGs). IHC is a non-profit integrated delivery system of 20 hospitals, over 70 outpatient clinics, and an employed group of physicians. IHC's facilities range from major tertiary-level teaching and research facilities, to small hospitals and clinics in rural communities.

The CPG collection is organized into consistent document groups ("*problem*", "*risk for problem*", "*protocol*", "*procedure*", and "*teaching plan*"). Each document group follows a specific template, and the main sections of these templates are items like "*tasks*", "*goals*", "*documentation needs*", "*risk factors*", "*symptoms*", "*laboratory and diagnostic findings*", and "*literature references*" [11]. An important characteristic of the collection is that documents are modular, and therefore potentially reusable.

In order to facilitate access, the CPG collection has been produced and disseminated electronically since its inception. A proprietary SGML-based tool was used initially, but more recently an open XML-based framework has been implemented [11]. All CPG documents are stored in a centralized Knowledge Repository (KR) as XML documents. Nurses and other clinicians can search and browse the CPG collection using an intuitive web-based tool called "*CPG Viewer*" [12]. The *CPG Viewer* presents the collection as an electronic book ("*e-book*"), with basic and advanced search functions, a detailed table of contents, and a series of custom-built indexes.

The *CPG Viewer* also uses a flexible monitoring infrastructure that generates detailed auditing logs. These logs can be used to retrace every interaction between the user and the tool, including functions used, documents viewed, and hyperlinks traversed.

In order to use the *CPG Viewer*, nurses need to log in using the same user identification required by other IHC clinical systems. The monitoring is completely non-intrusive and it has minimal impact on the *CPG Viewer*'s performance.

METHODS

The pilot study was conducted in three inpatient acute care units: a) A 46-bed medical unit at a tertiary hospital (LDS Hospital), with 44 nurses; b) The 39-bed Medical/Surgical Intermediate Care Unit at a secondary hospital (McKay-Dee Hospital), with 54 nurses; and c) A 22-bed rural hospital (Heber Valley Medical Center), with 28 nurses. All three sites included RNs (Registered Nurses) and LPNs (Licensed Practical Nurses) on their nursing staff. We selected sites based on interested leadership, hardware/software availability, location reasonably close to research personnel, and setting diversity (a teaching hospital, a community hospital, and a rural hospital). Pilot study length of approximately 4 months was based on local operational constraints.

Nurses from these three sites were trained to use the *CPG Viewer* to search and browse the CPG documents. We expected that they would use the tool as part of their routine clinical work, and no special incentive was provided. The nurses' interactions with the tool were recorded using the monitoring infrastructure.

At the end of each session (logout or simply closing the *CPG Viewer* window), the nurse was presented with a questionnaire. The questionnaire was designed to specifically ask the nurse what information he/she was looking for, and a confirmation if he/she had found the information. The answers to the questionnaire were also recorded in the same monitoring database.

The monitoring infrastructure includes:

1. General Information (Mandatory): Login Identification; Start/End Time.
2. Search Behavior Information (Mandatory): Search type; Queries made ("search strings"); How many documents have been returned in a query; Which document has been opened and its position in the query results list; For how long the document was viewed (opened).
3. Questionnaire Results (Optional):
   - I. What information the user is looking for, with thirteen subcategories (The user was asked to choose at least one):
     1) What is the protocol/ procedure for ___
     2) What are the symptoms of ___
     3) What are the laboratory values for ___
     4) What does the user need to document for ___
     5) What are the risk factors for ___
     6) What does the user assess for ___
     7) What equipment does the user need for ___
     8) What is the definition of ___
     9) What is the cause of ___
     10) What is the treatment for ___
     11) What is the anatomy of ___
     12) What is the physiology of ___
     13) Other ___
   - II. Was the user successful in finding the information
   - III. Why the user hasn't found the information
   - IV. Will the user act on the information he/she has just found in today's patient care

After the approximately 4-month data collection phase, we used the monitoring data to identify all information-seeking sessions in which the optional questionnaire had been filled out. The monitoring data collected during the information-seeking session were used in conjunction with the questionnaire answers to further understand the information seeking behaviors. For instance, if a nurse had indicated in the questionnaire that he/she was looking for a protocol related to "pain", and also indicated that the information was found, we reviewed the monitoring data to identify the search strategies used, and if the appropriate documents were actually found and opened.

A CPG document expert was responsible for identifying the most appropriate document(s) that contained the answer(s) to the user's question(s). The document expert is an experienced RN that has been directly involved with the development and maintenance of the CPG documents for over five years. For each information need recorded in the questionnaire, the expert was asked to use *CPG Viewer* to find the most appropriate document (if it existed), and to estimate how much time a given user would need to spend in order to find the information in the document. In addition, the document expert used the monitoring data to identify whether information needs were really fulfilled or not based on the document that was found by the users and the time spent reading the document.

RESULTS

Data were collected at the LDS and McKay-Dee hospitals from November 8, 2004 to March 1, 2005. The Heber Valley data collection period started a week later (from November 15, 2004 to March 1, 2005).

Out of the 126 potential users, 60 nurses, or 47.6%, used the *CPG Viewer* during this period, resulting in 178 information-seeking sessions. Twenty three (38.3%) nurses used the *CPG Viewer* only once, 14 (23.3%) nurses used the tool twice, 20 (33.3%) used it between 3 and 8 times, and 3 (5%) used it relatively frequently (from 11 to 13 times).

Out of the 178 sessions, 54 questionnaires (30.3%) were filled out. Twenty-eight nurses were responsible for all the questionnaires (Figure 1). Among the 28 nurses, 12 (42.9%) nurses filled out the questionnaire more than once; 6 (21.4%) provided both positive and negative feedback in different questionnaire events; 9 (32.1%) provided only negative feedback and 13 (46.4%) provided only positive feedback.

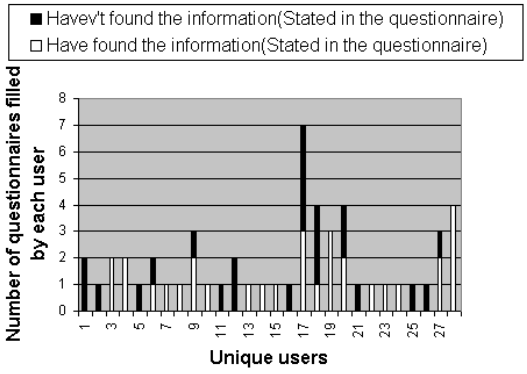

Figure 1. Distribution of feedback from 28 nurses who filled out the questionnaire

Fifteen (53.6%) out of 28 nurses who completed the questionnaire used the *Viewer* again during the pilot study (Table 1).

Table 1. Repeat use of Viewer by nurses who completed the questionnaire

"Information found" (user answer)	Total Count	Repeat use Count	Repeat use Percentage
"Yes"	13	7	53.8%
"No"	9	4	44.4%
"Yes" & "No"	6	4	66.7%
Total	28	15	53.6%

Users indicated that the needed information was found in 31 (57.4%) questionnaires and was not found in 23 (42.6%) questionnaires. Table 2 illustrates agreement between users and the CPG document expert with respect to document information content.

Table 2: Agreement between users and CPG document expert about information found

"Information found" (user answer)	Document Expert Answer		Total
	Yes	No	
"Yes"	28	3	31
"No"	3	20	23
Total	31	23	54

Table 3 summarizes the frequency of information needs identified from questionnaire responses.

DISCUSSION

The overall conclusion from the pilot data are that *CPG Viewer* was used by about half of potential users during the context of clinical care, and users reported success in finding the information sought over half of the time. In addition, the monitoring data allow us an unprecedented opportunity to investigate the information- seeking behavior of bedside nurses and provide developers with feedback necessary to improve the usefulness of the tool.

A relatively high proportion (38.3%) of nurses used the *CPG Viewer* only once. Repeat use tended to be higher among those who were successful in finding information compared to those who were not, however the sample size was too small to draw any confident conclusions. We have not yet investigated differences in the groups that use the *Viewer* frequently and those who do not. Potential explanations for non-use of the tool include (but are not limited to) workload constraints (staff are too busy to use the tool), a preference for consulting with peers to satisfy information needs, or the use of unit-specific information.

It was apparent that despite our attempt to make the questionnaire easy to respond to, most users chose not to fill it out (69.7%). We were also concerned over the reported rate (42.6%) of unsuccessful information seeking sessions; we speculate that the reason(s) for lack of success include unfamiliarity with *CPG collection* coverage, need for improved document search capabilities, or need for more content than is currently available in the documents.

The data in Table 2 indicate that the CPG document expert and nurses agree that the information found by the nurses did satisfy the information need for the majority of sessions. There were, however, 6 cases

Table 3 - Frequency of the information needs identified through the questionnaire

Questionnaire question (representing the information need)	Information found (count)	Information not found (count)	Total Count	Percent.	Ranking
1. What is the protocol or procedure for "X"?	25	14	39	48.15%	1st
2. What do I assess for "X"?	8	1	9	11.11%	2nd
3. What are the symptoms of "X"?	5	1	6	7.41%	3rd
4. What is the definition of "X"??	2	3	5	6.17%	4th
5. What are the lab values for "X"?	2	3	5	6.17%	4th
6. What do I need to document for "X"?	2	2	4	4.94%	6th
7. What are the risk factors for "X"?	4	0	4	4.94%	6th
8. What is the treatment of "X"?	2	0	2	2.47%	8th
9. What is the physiology of "X"?	0	1	1	1.23%	9th
10. What is the cause of "X"?	0	0	0	0	
11. What's the equipment for "X"?	0	0	0	0	
12. What is the anatomy of "X"?	0	0	0	0	
13. Other	3	3	6	7.41%	Excluded
Total	**53**	**28**	**81**	**100%**	

when the user and document expert disagreed about whether the information need was satisfied by the information content in the documents. In the three false positive cases, the user indicated information was found but the document expert felt the information sought was not available in the search session; the reason for the disagreement is unclear. In the three false negative cases the user indicated the information was not found when the document expert felt the information was in the documents accessed. The reasons for the failures included improper document indexing, the nurse could not find the information within the document after searching for 3 minutes, and the nurse found the correct document but did not open it during the search session.
In the 20 cases where nurses' information needs were not satisfied, the clinical content sought was either not available or not specific enough to meet the information needs. These unsatisfied information needs indicate the importance of understanding the information needs and incorporating access to the information into the tool whenever possible by providing links to other internal document sources (unit- or hospital-specific documents) or external document sources (licensed from vendors or openly available on the Internet).

Our findings suggest that nurses' information needs differ from what is reported in the literature compared to physician's information needs. About half of the time, *CPG Viewer* users were seeking information about "protocols" and "procedures", as opposed to "choices of drugs" or "cause of symptoms", as reported by Ely et al [7]. The only information need we observed that has also been identified by Ely et al is "treatment for a given condition". This particular need ranks 7th in Ely's study and 8th in our study. The differences observed confirm that nurses and physicians have different care delivery responsibilities, goals, and activities, emphasizing the importance of distinguishing their information needs.

There are several limitations to our study, most of them resulting from the relatively small sample size. It is certainly premature to try to explain the problems and findings we identified, and to try to suggest mechanisms to correct them. What is clear, on the other hand, is the need to explore in more detail the nurses' information needs. In a future study, we intend to combine the non-intrusive method used here with a more traditional observational method [6,13].

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